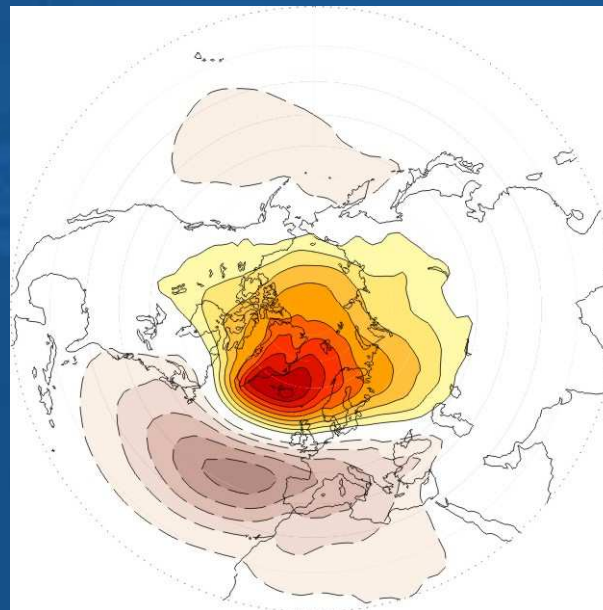


On the hemispheric scale of the winter NAO



J. García-Serrano (BSC-ES) and R. J. Haarsma (KNMI)

On the hemispheric scale of the winter NAO

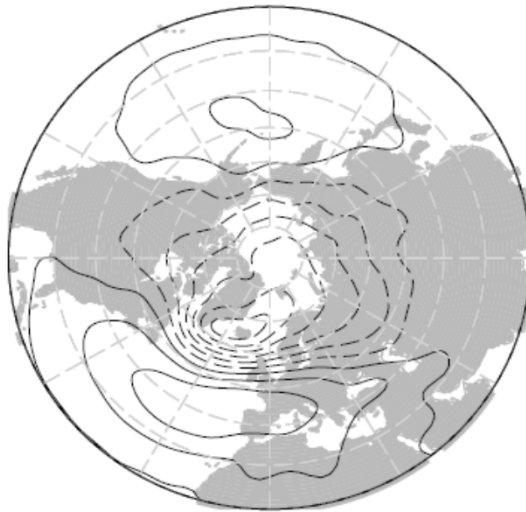


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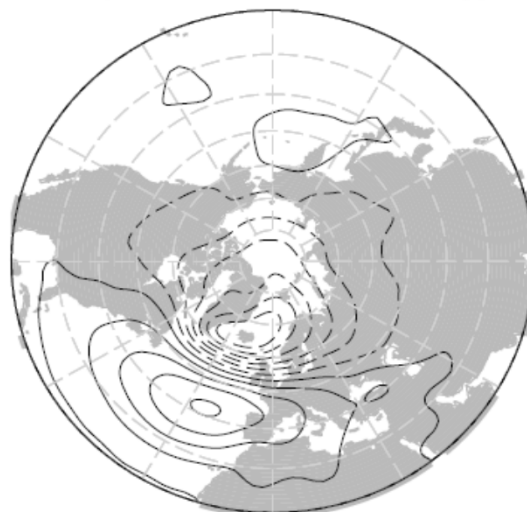
AO

NH



NAO

NH (Euro-Atlantic sector only)



(JFM, 1958-1999; Thompson et al. 2003)

On the hemispheric scale of the winter NAO

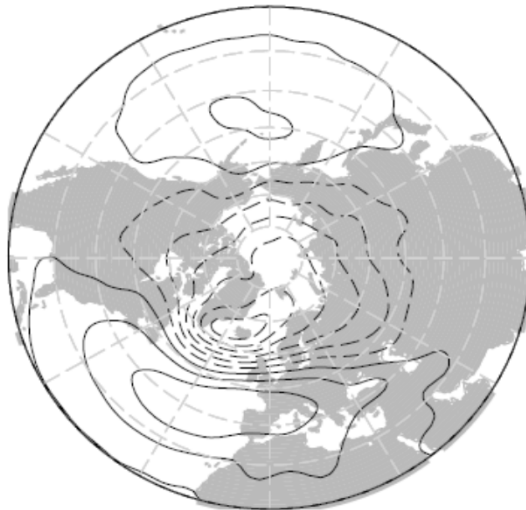


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AO

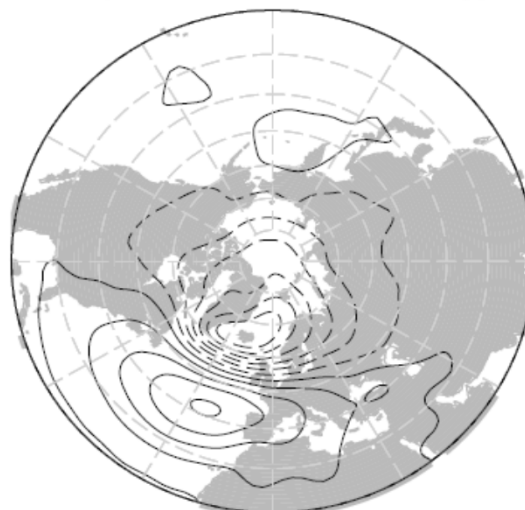
NH



(JFM, 1958-1999; Thompson et al. 2003)

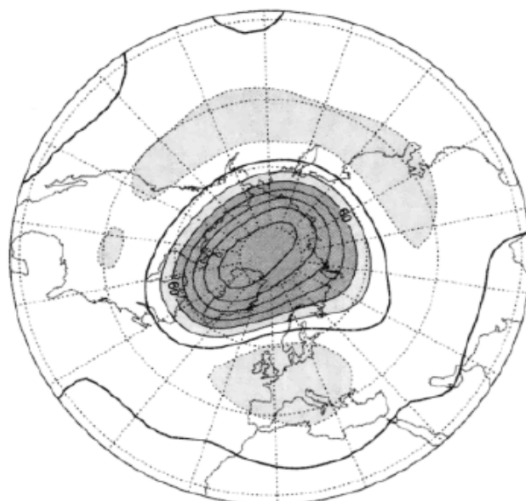
NAO

NH (Euro-Atlantic sector only)



NAM at 50hPa

(Z50; Baldwin et al. 1994)



On the hemispheric scale of the winter NAO

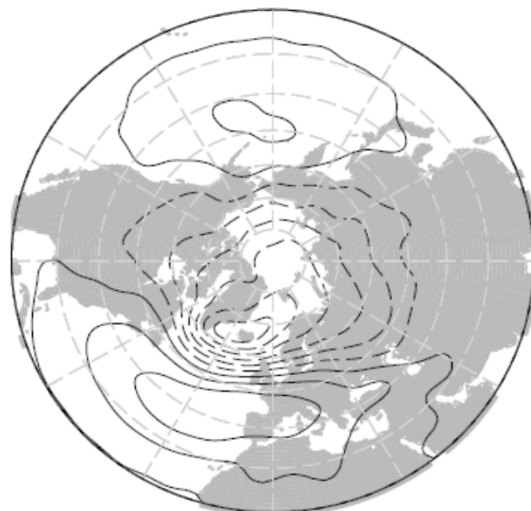


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AO

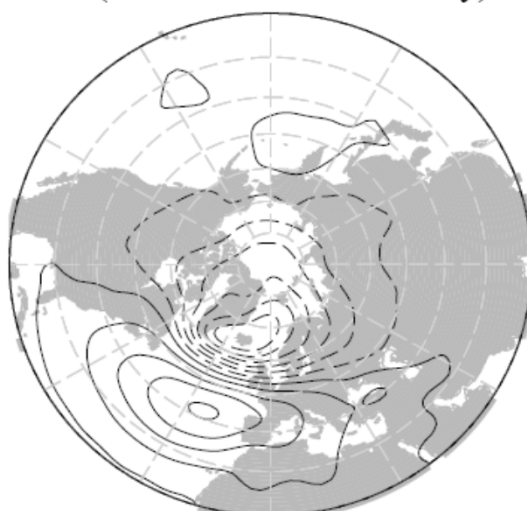
NH



(JFM, 1958-1999; Thompson et al. 2003)

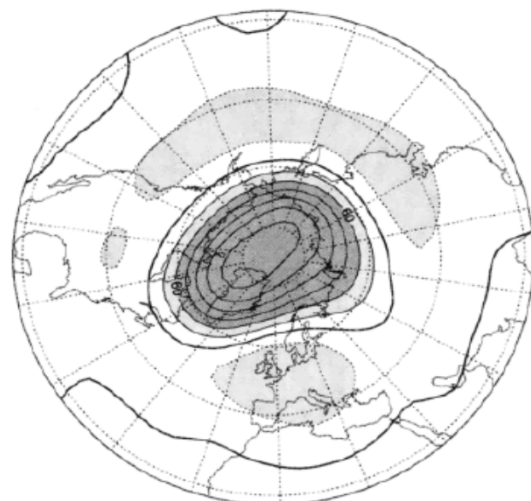
NAO

NH (Euro-Atlantic sector only)

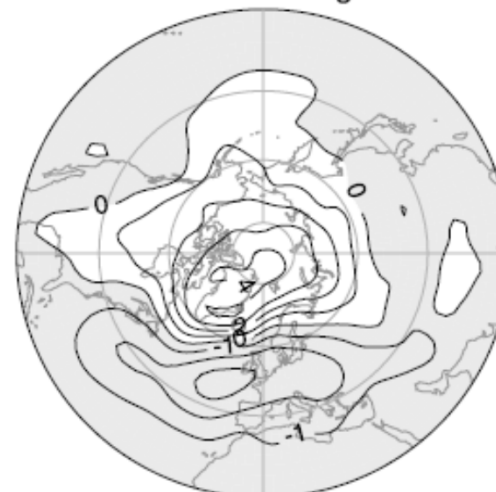


NAM at 50hPa

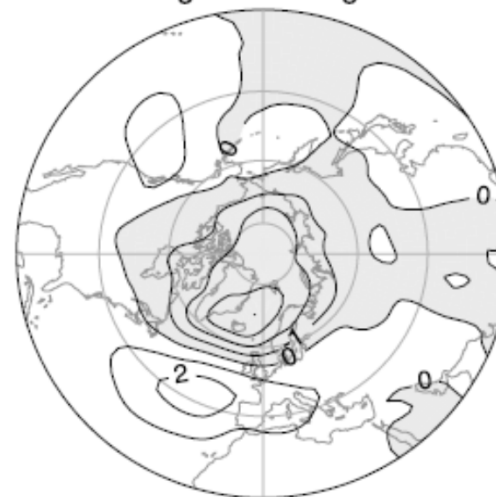
(Z50; Baldwin et al. 1994)



a Weak Vortex Regimes



b Strong Vortex Regimes



(SLP; Baldwin and Dunkerton 2001)

On the hemispheric scale of the winter NAO

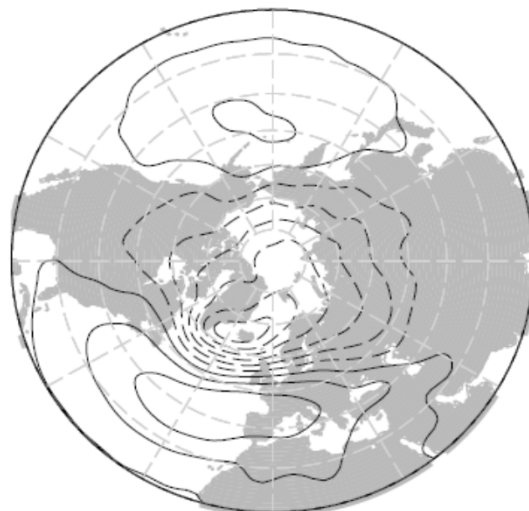


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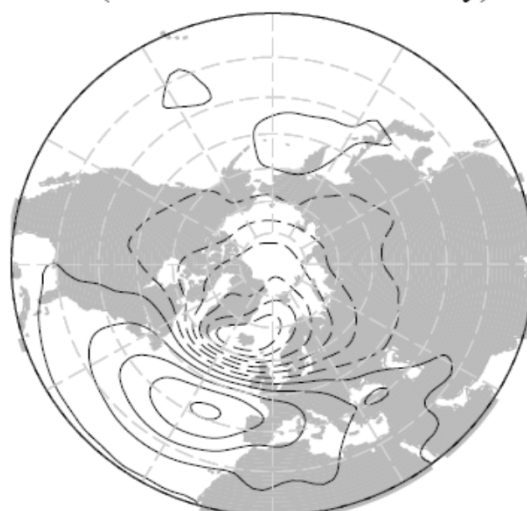
AO

NH



NAO

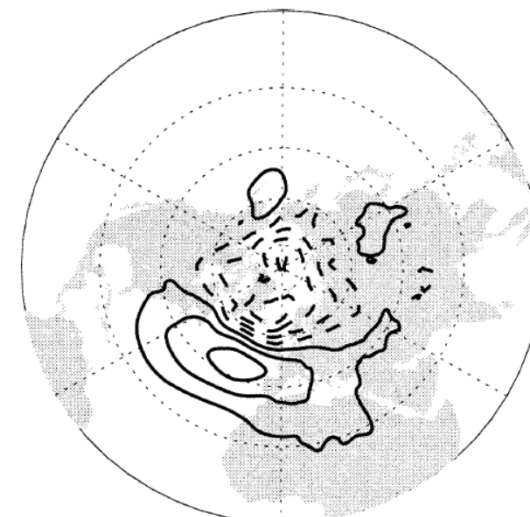
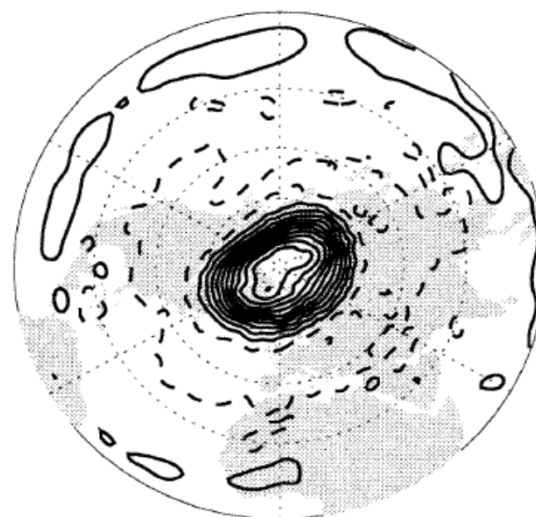
NH (Euro-Atlantic sector only)



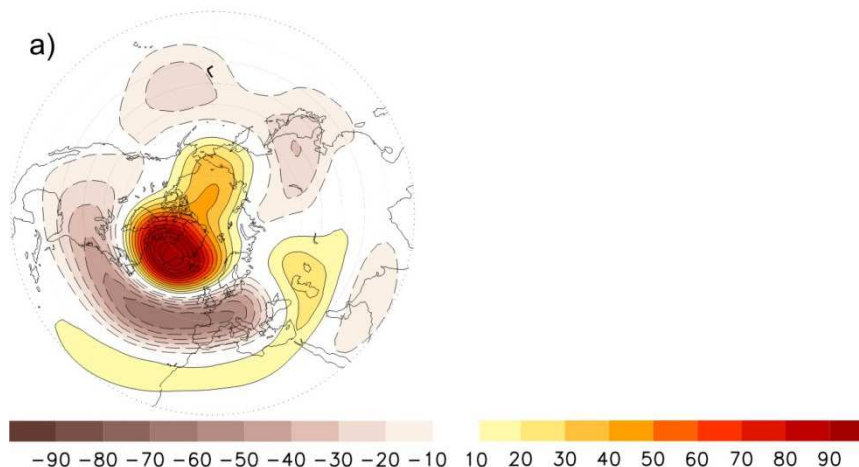
(JFM, 1958-1999; Thompson et al. 2003)

SPV at 50hPa

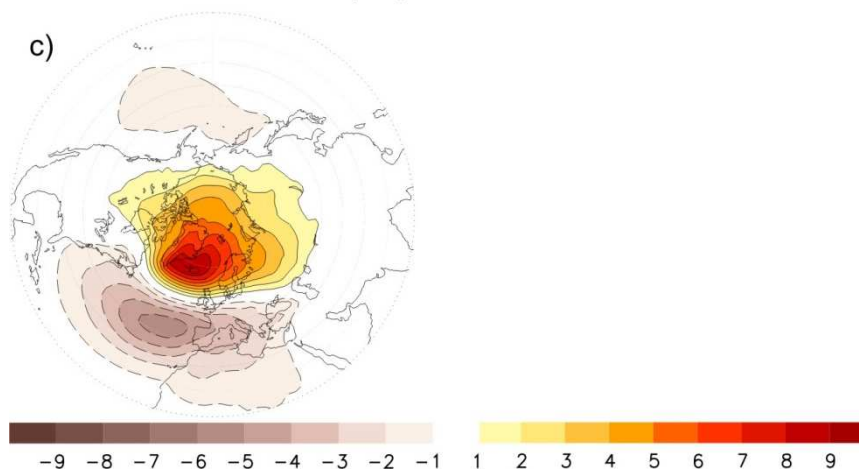
(PV-500K ~20km
Ambaum and Hoskins 2002)



NAO x Z300 / ERA40 (JF)



NAO x SLP / ERA40 (JF)



winter NAO has a distinct global signature at upper-tropospheric levels
(Branstator 2002)

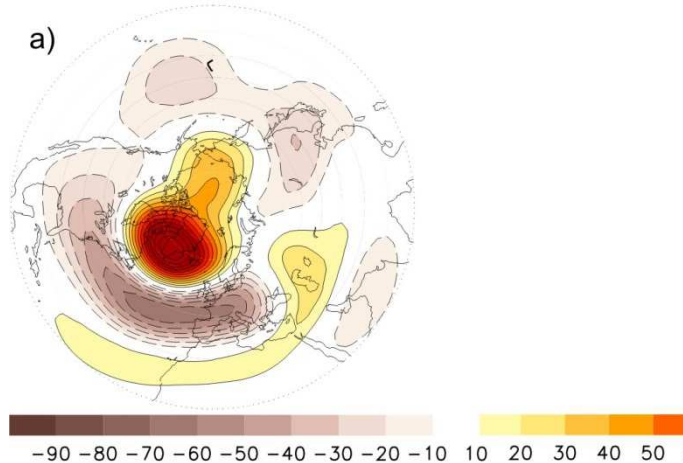
On the hemispheric scale of the winter NAO



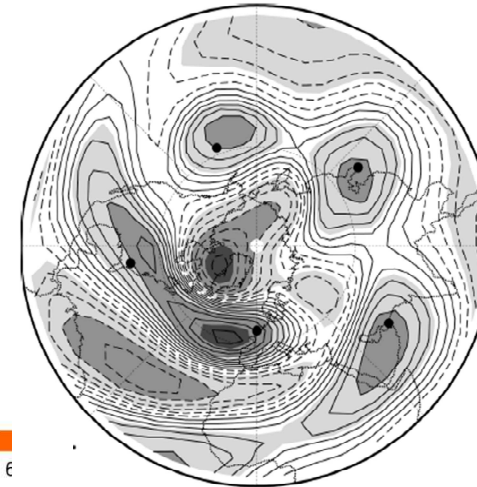
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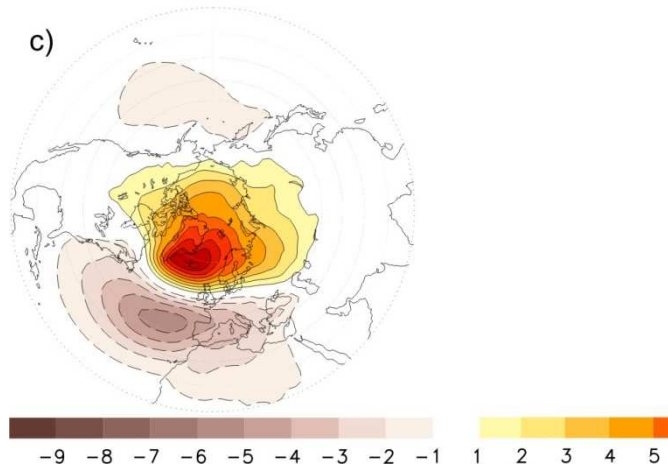
NAO x Z300 / ERA40 (JF)



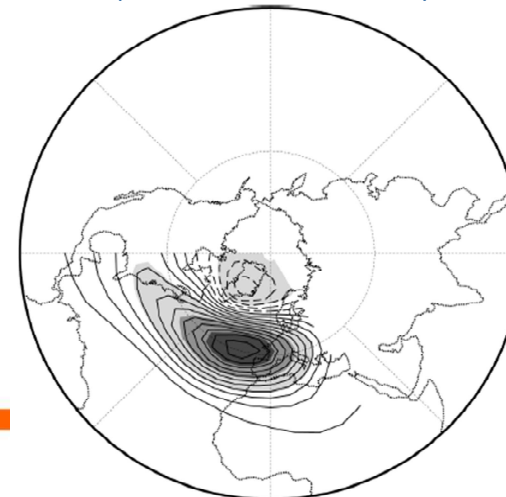
(NAO x PSI300)



NAO x SLP / ERA40 (JF)



(NAO from PSI850)



winter NAO has a distinct global signature at upper-tropospheric levels
(Branstator 2002)

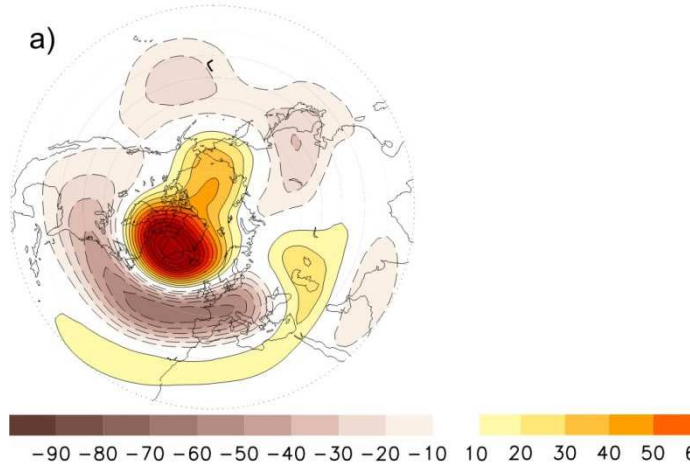
On the hemispheric scale of the winter NAO



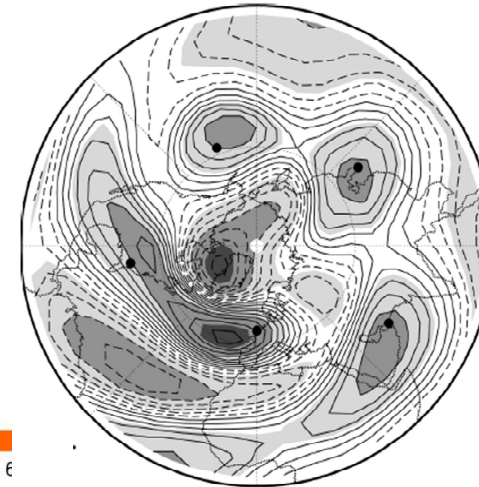
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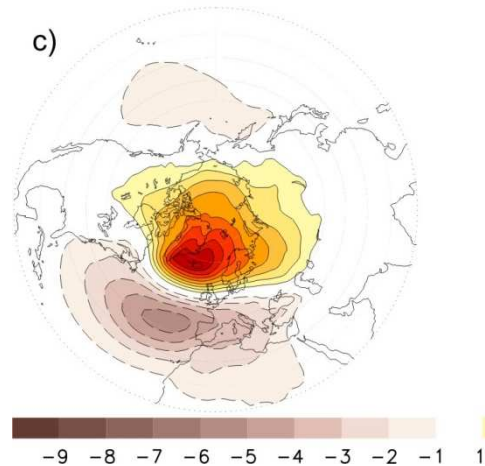
NAO x Z300 / ERA40 (JF)



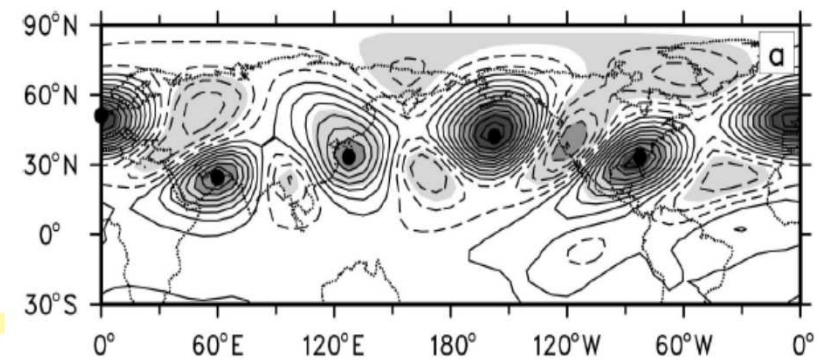
(NAO x PSI300)



NAO x SLP / ERA40 (JF)



(NAO x v300)



winter NAO has a distinct global signature at upper-tropospheric levels
(Branstator 2002)

On the hemispheric scale of the winter NAO

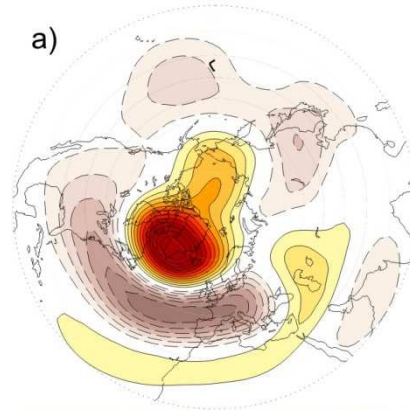


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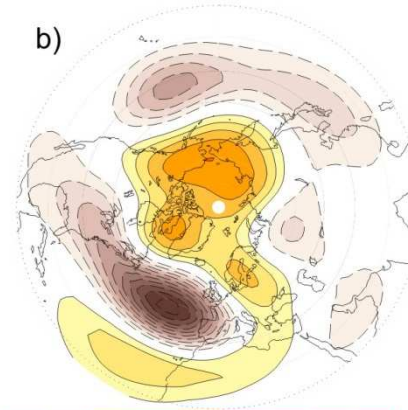
EXCELENCIA
SEVERO
OCHOA

NAO/CWP
paradigm

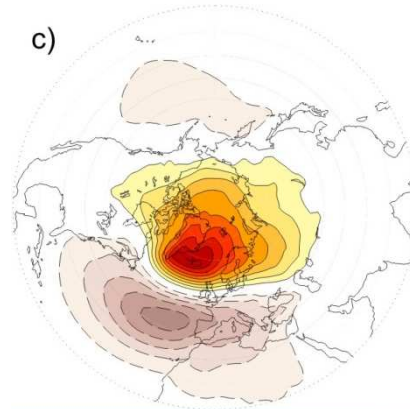
NAO x Z300 / ERA40 (JF)



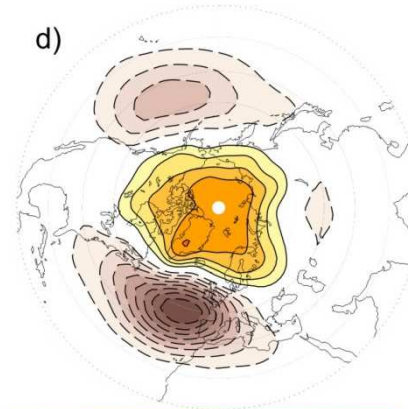
NAO x Z300 / SPEEDO (JF)



NAO x SLP / ERA40 (JF)



NAO x SLP / SPEEDO (JF)



winter NAO has a distinct global signature at upper-tropospheric levels
(Branstator 2002)

On the hemispheric scale of the winter NAO

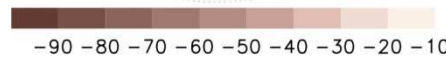
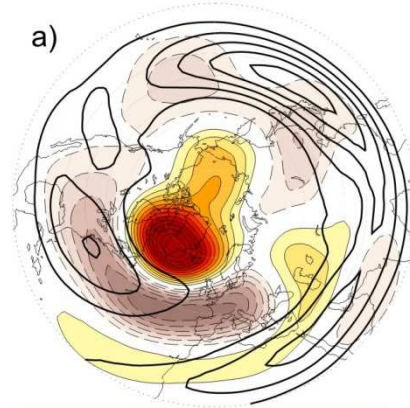


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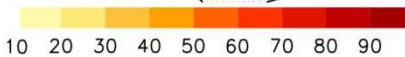
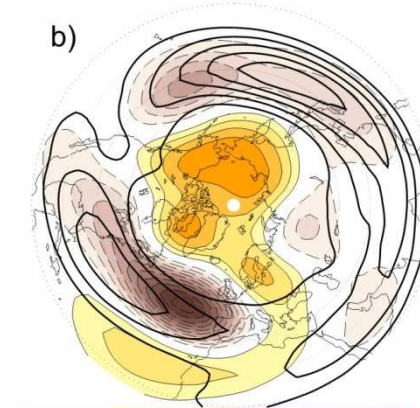


NAO/CWP
paradigm

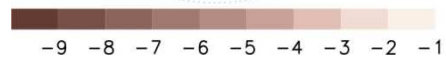
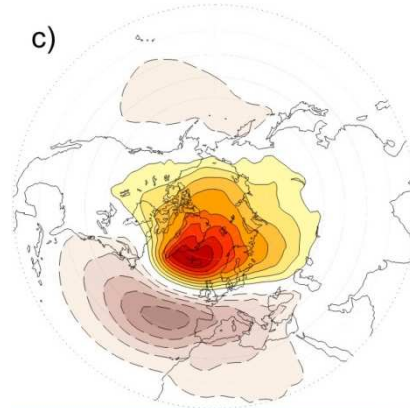
NAO x Z300 / ERA40 (JF)



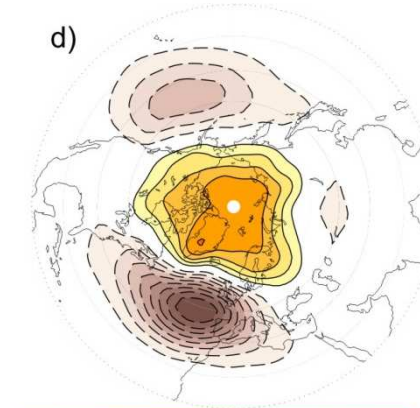
NAO x Z300 / SPEEDO (JF)



NAO x SLP / ERA40 (JF)



NAO x SLP / SPEEDO (JF)



winter NAO has a distinct global signature at upper-tropospheric levels
(Branstator 2002)

SPEEDY (e.g. Haarsma and Hazeleger 2007)

intermediate complexity AGCM

no stratosphere

T30 (96 lon x 48 lat)

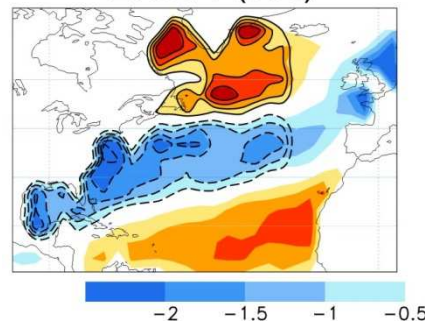
L7 (925, 850, 700, 500, 300, 200, 100)

200-member, 30-day long CTL + EXP (NAO+, NAO-)

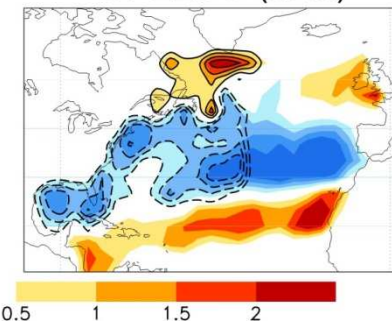
NAO/CWP
paradigm

[vs. *EC-EARTH3.2 T255L91*]

e) boundary conditions
ERSST (obs)



f) boundary conditions
SPEEDO (mod)

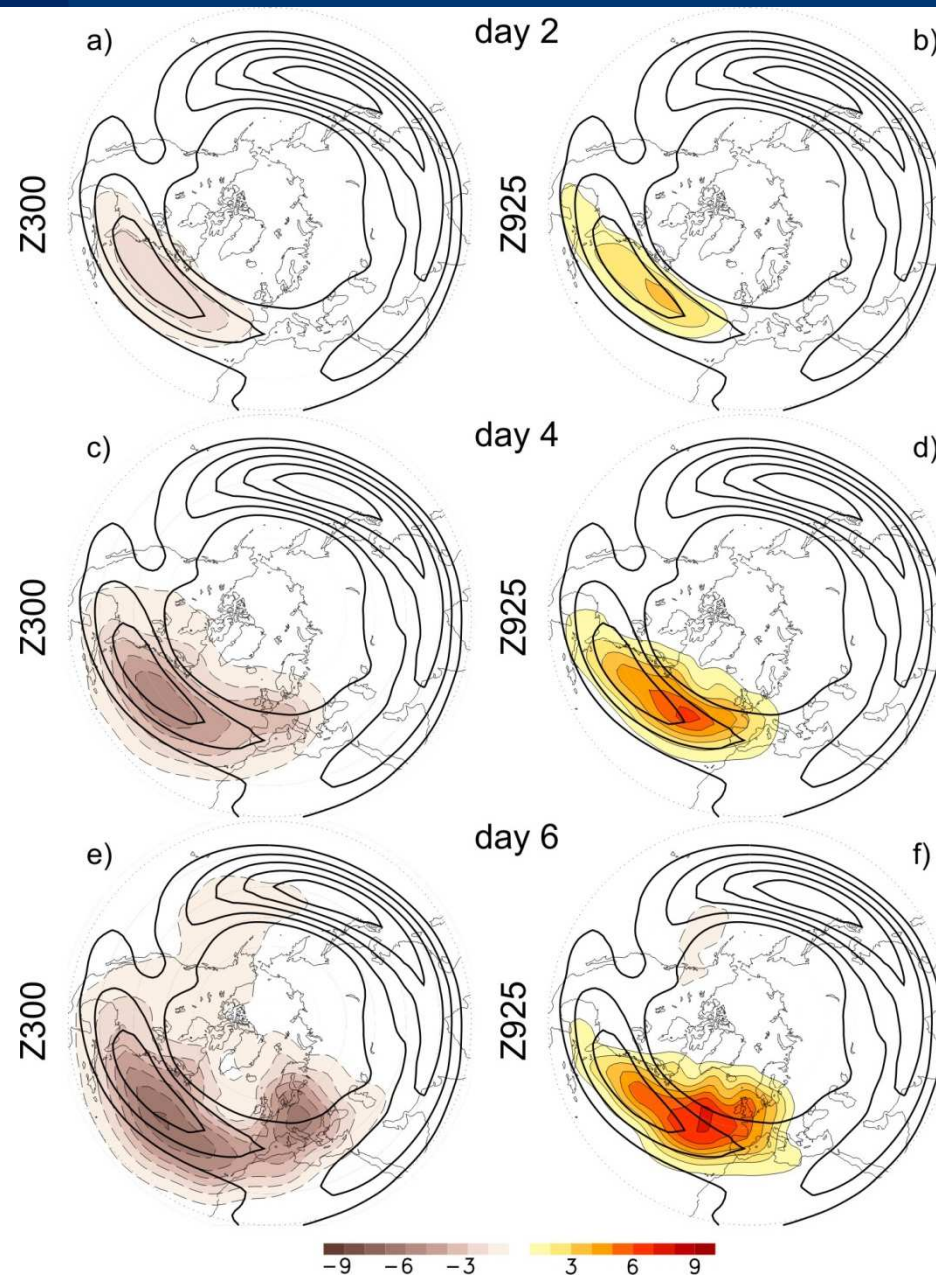


On the hemispheric scale of the winter NAO



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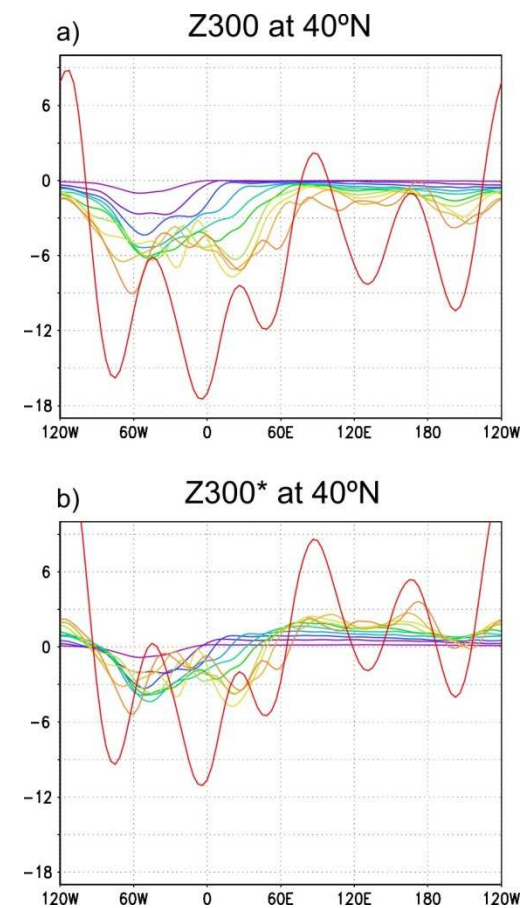
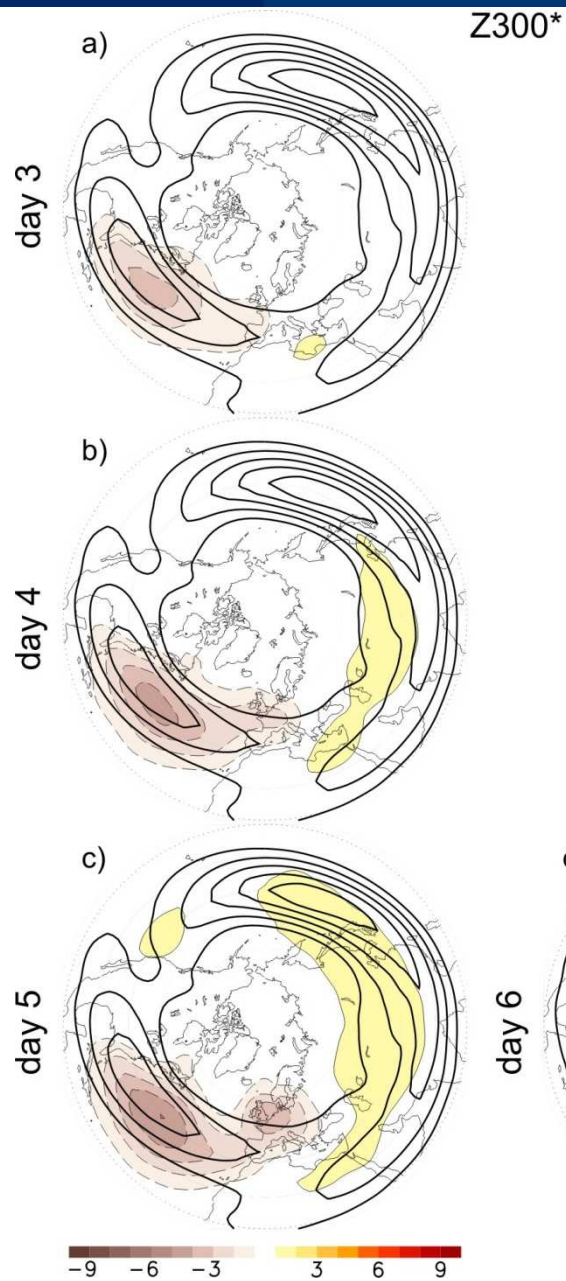


On the hemispheric scale of the winter NAO



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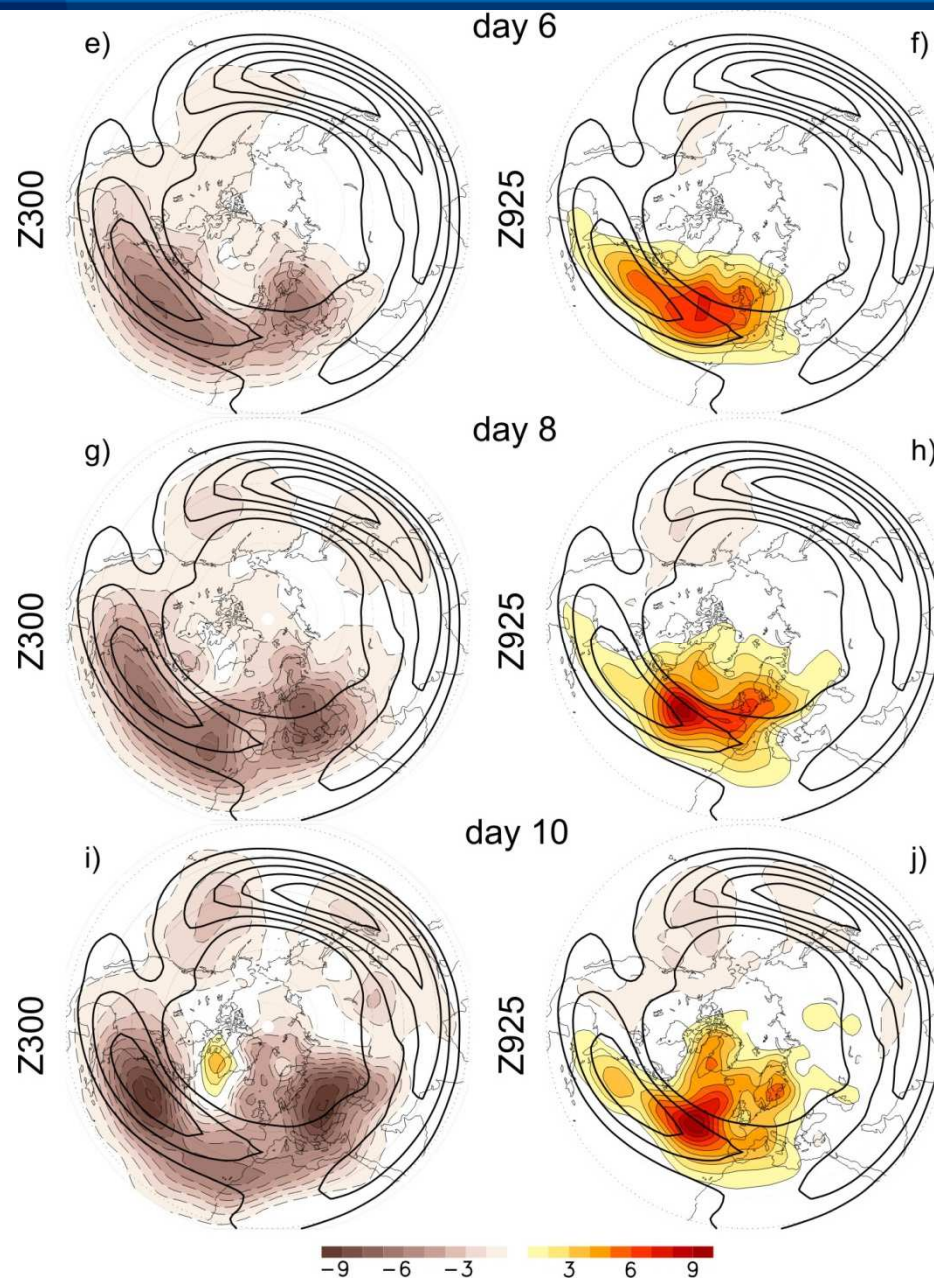


On the hemispheric scale of the winter NAO



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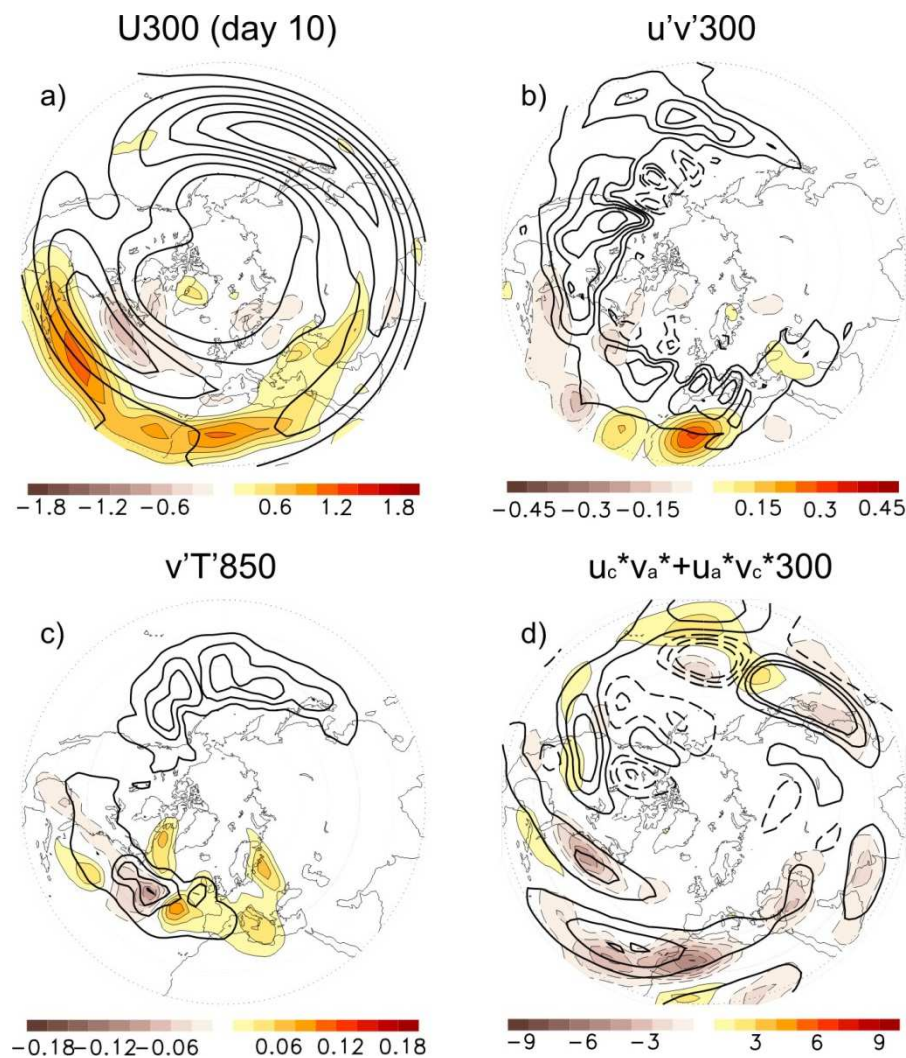


On the hemispheric scale of the winter NAO



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transient-eddy activity, zonal-eddy coupling

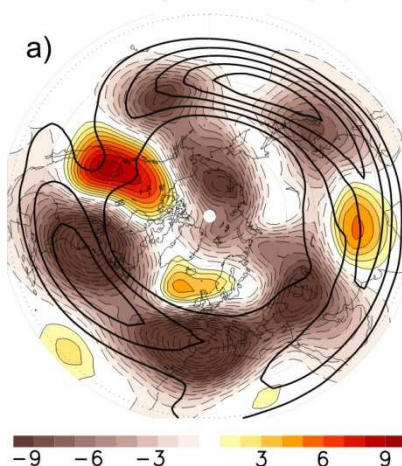
On the hemispheric scale of the winter NAO



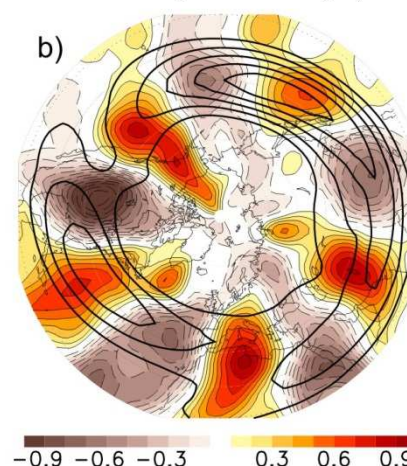
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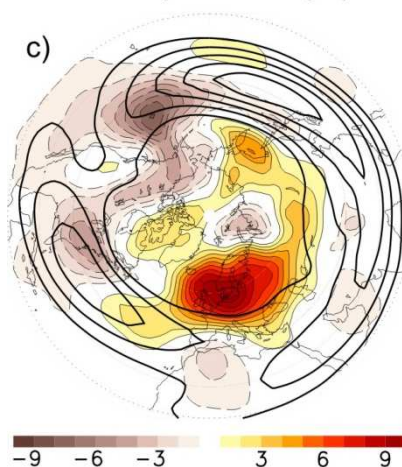
Z300 (15-30 days)



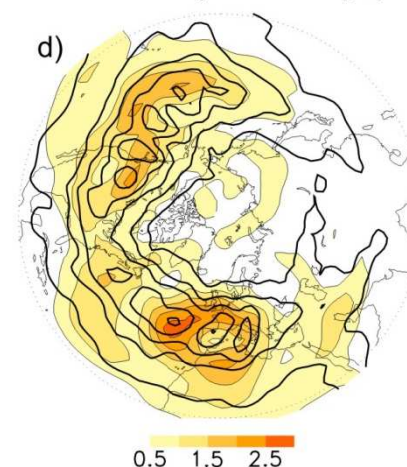
V300 (15-30 days)



Z925 (15-30 days)



PKE300 (15-30 days)



quasi-equilibrium, non-linear stage

SUMMARY:

- the hemispheric signature of the NAO could be explained by tropospheric dynamics
- without the need of interaction with the stratosphere
- involving a Rossby wavetrain channelized into the westerly jets
- consistent with the CWP pattern at the upper troposphere

¿? why the predominance of wavenumber-5 in the CWP

¿? how annular dynamics in the stratosphere but non-annular in the troposphere